

IF INTERFACE

A SPECTRAL BASED PROPOSAL

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CRITERIA

1. Spectral Based
2. Can Easily Migrate with Future Services
3. Maximize Cashflow to the Operator
4. Allows Visibility of the ODU & IDU Network Elements
5. Can deal with long ODU & IDU Runs
6. Interoperability Must be Possible
7. No Royalties



SPECTRAL BASED

- **KEY to allowing independent channels to be assigned that are orthogonal from a system perspective**



ABILITY TO MIGRATE

- **Inherent with a Spectral Based Plan**
 - In 5 YRS what will survive a protocol or a frequency allocation
 - What is easier to marry technology wise?
- **Assignability of Spectrum by Technology**
 - eg. Of Changing a QPSK modem with a 64QAM
- **Allows Multiple IDU Devices to be Coordinated Through a Spectral Based IF**



MAXIMIZE CASHFLOW

- **Bits per Hertz Issue that relates to the Phase Noise of the Local Oscillators**
 - as phase noise decreases more complex modulation schemes can be implemented
- **Ability of the IDUs to handle video streams will allow for the full range of services**
 - compressed real time video streams can't be interrupted
- **Multiple IDUs from One ODU is Desirable**
 - Spectral Based Allows for this and Migration



VISIBILITY OF ODU & IDU

- **A Multimedia Network needs to Manage its ODU & IDU Resources Dynamically**
 - computing requirements significant but largely IDU centered and largely SNMP based
- **COST of Computing Can be an Issue**
- **SUGGESTION - Make the ODU Radio Dumb & Simple & Use Smarts in IDU**
 - Use the IDUs compatible SNMP MIB to communicate with the Network Management System and use the more powerful IDU computer to communicate with the ODU

RADIO CMD LANGUAGE

- **Provide Simple Format to Communicate with the ODU from an IDU to Provide the Necessary Network Visibility**
 - minimizes computing requirements of the ODU
- **Essential Monitoring and Control Specified**
 - Four Tx Related (ON/OFF, Max Power, Gain & Translation Frequency)
 - Three Rx Related(Gain, Translation Frequency & Sensitivity[?])
 - Four Alarms (Local Oscillators, Amplifiers Bias, Current Draw and Temperature)



LONG ODU/IDU CABLE

- **At RF the losses on regular RG 6 are significant beyond 200 feet above 1 GHz**
 - Requires engineered runs with hard line cable to get to equipment rooms in large buildings
 - High attenuation can adversely affect the customer transmit path
- **Linear Fiber Optics Provides an Option**
 - allows inexpensive runs to 2000 feet



INTEROPERABILITY

- **May be too Early Reach this Holy Grail but we need to Move Forward**
- **Key Areas of Discussion**
 - IF Band Plan(s) L Band Duplex or Dipeplexed
 - Radio Command Language
 - Connectors
 - Powering
 - Local Oscillator Reference Signals
 - Linear Optics



ROYALTIES

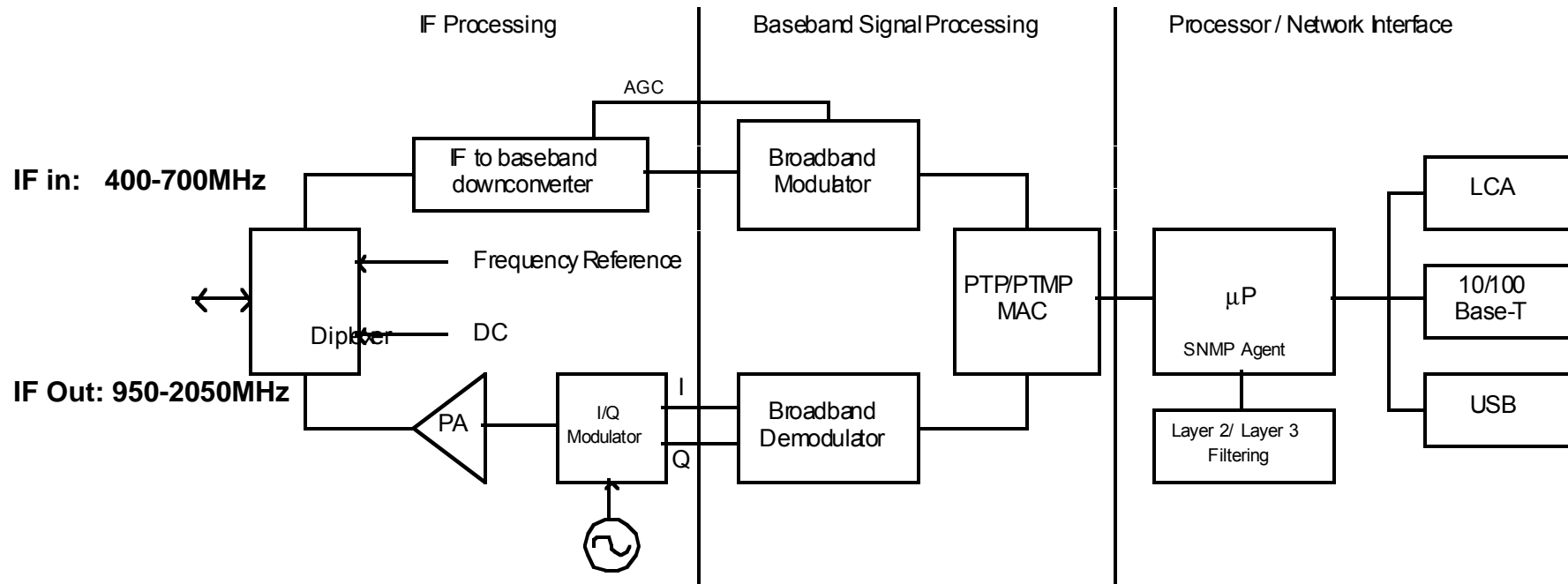
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- **None for a True Industry Specification**
- **Areas Requiring Clarification**
 - **DAVIC**
 - **Use of Ref. Carriers for the Local Oscillators**



Need for standardization

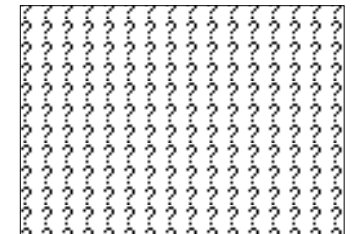
- **Standards lead to Lower cost of CPE component and subassemblies**
- **Same high volume RF and digital ICs from other systems can be used in LMDS systems**
 - Use RF ICs and components from DBS systems, MMDS systems, cable data modems, ISM band systems and PCS and cellular systems
 - Lowers development cost and time
- **Multiple standards may be needed for certain parameters to address different applications**
 - IF frequency : 950-2150, 200-600MHz etc.
 - Channel bandwidth $2 \times N$ MHz

LMDS Broadband IDU PTP or PTMP

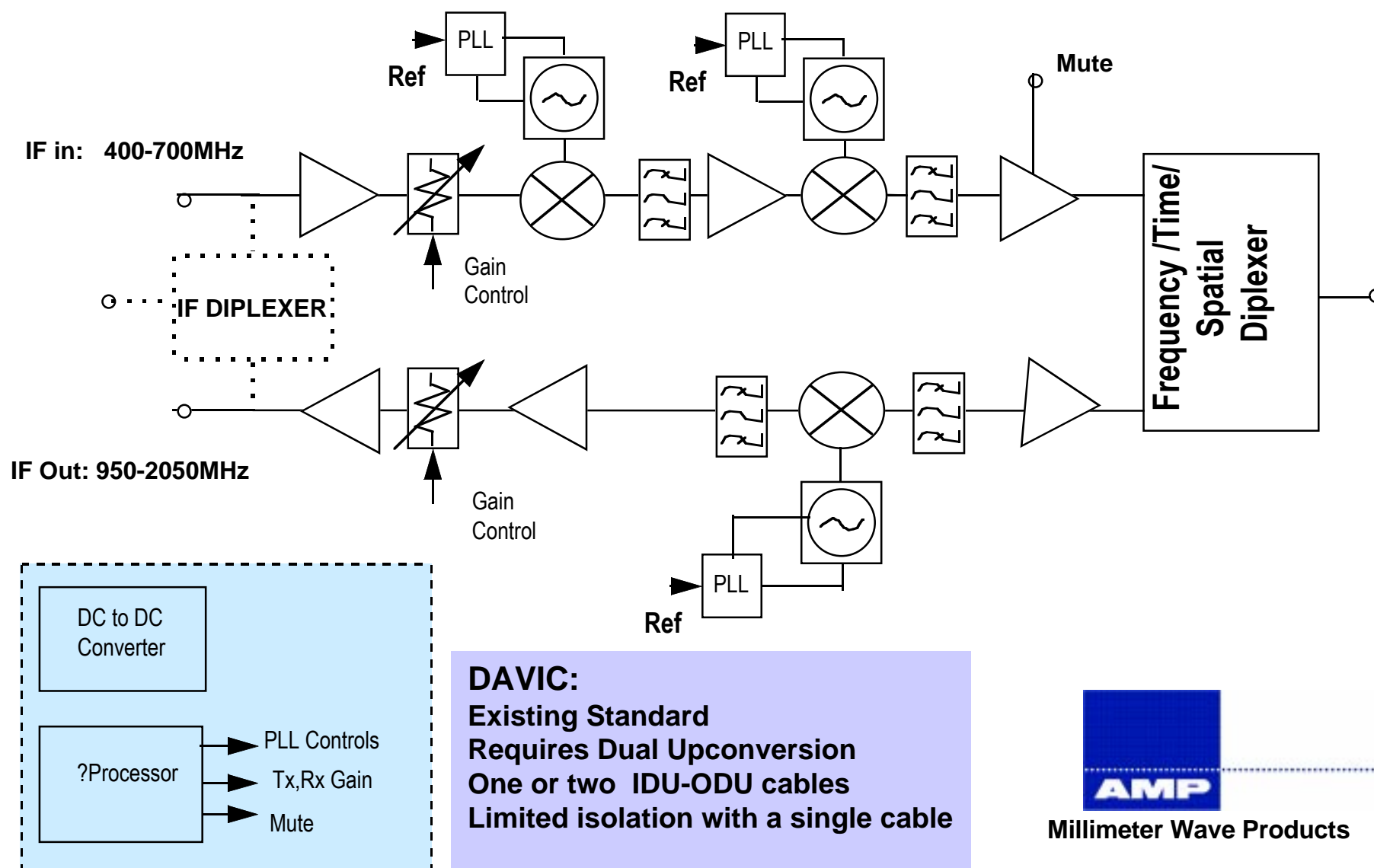


Features:

- IDU processor acts as **SNMP Proxy** for ODU
- Frequency reference sourced by IDU
- All CPE's are phased locked to single source
- Existing DAVIC standard

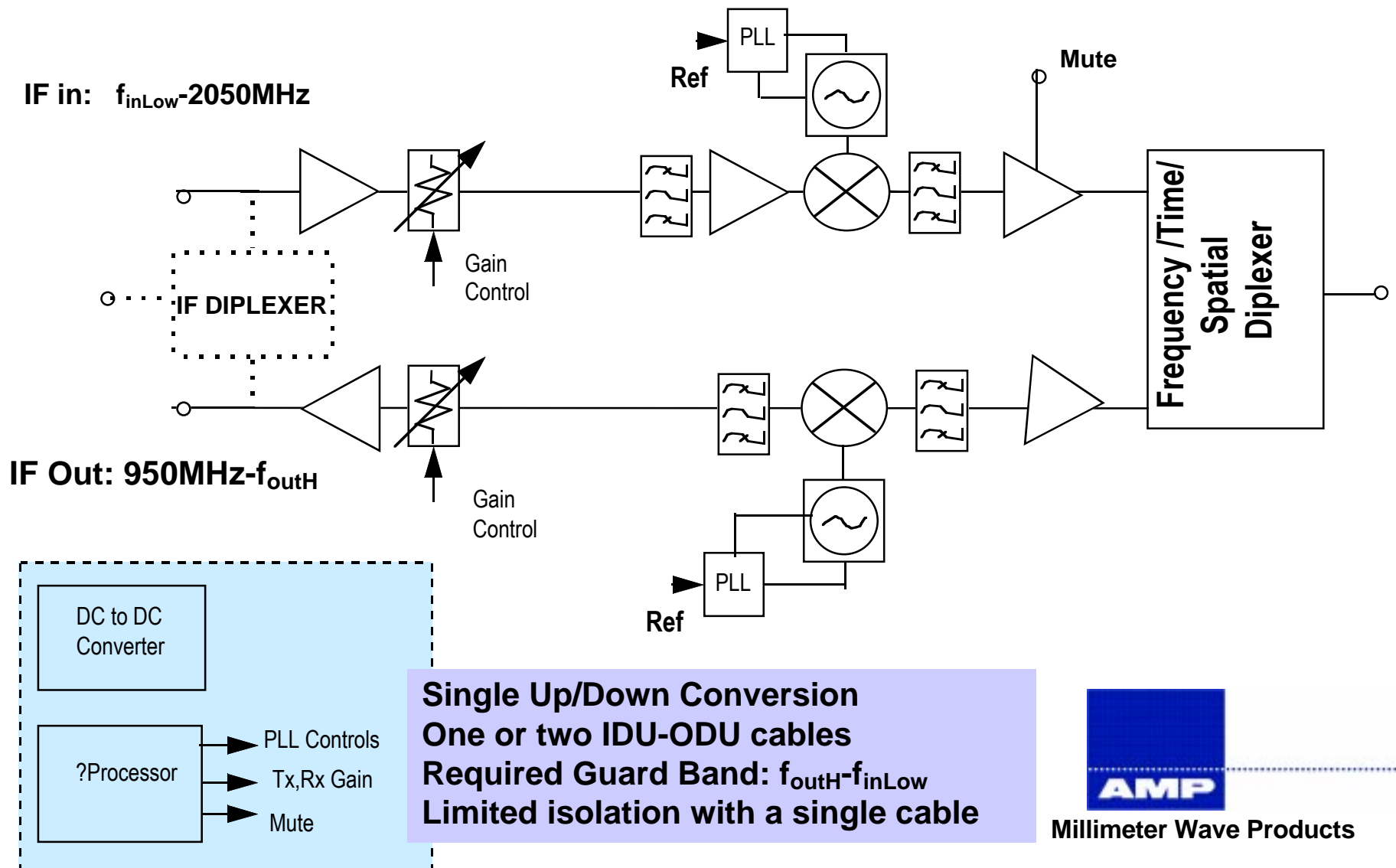


Generic LMDS RF ODU -DAVIC



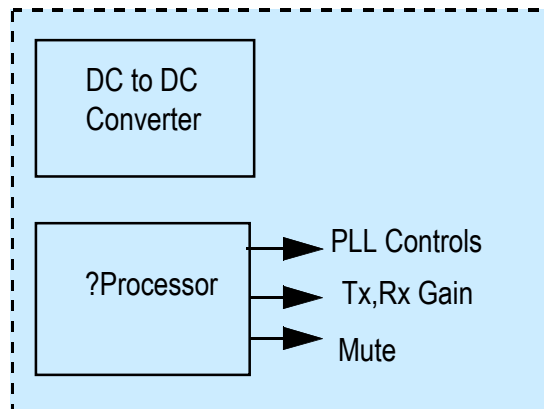
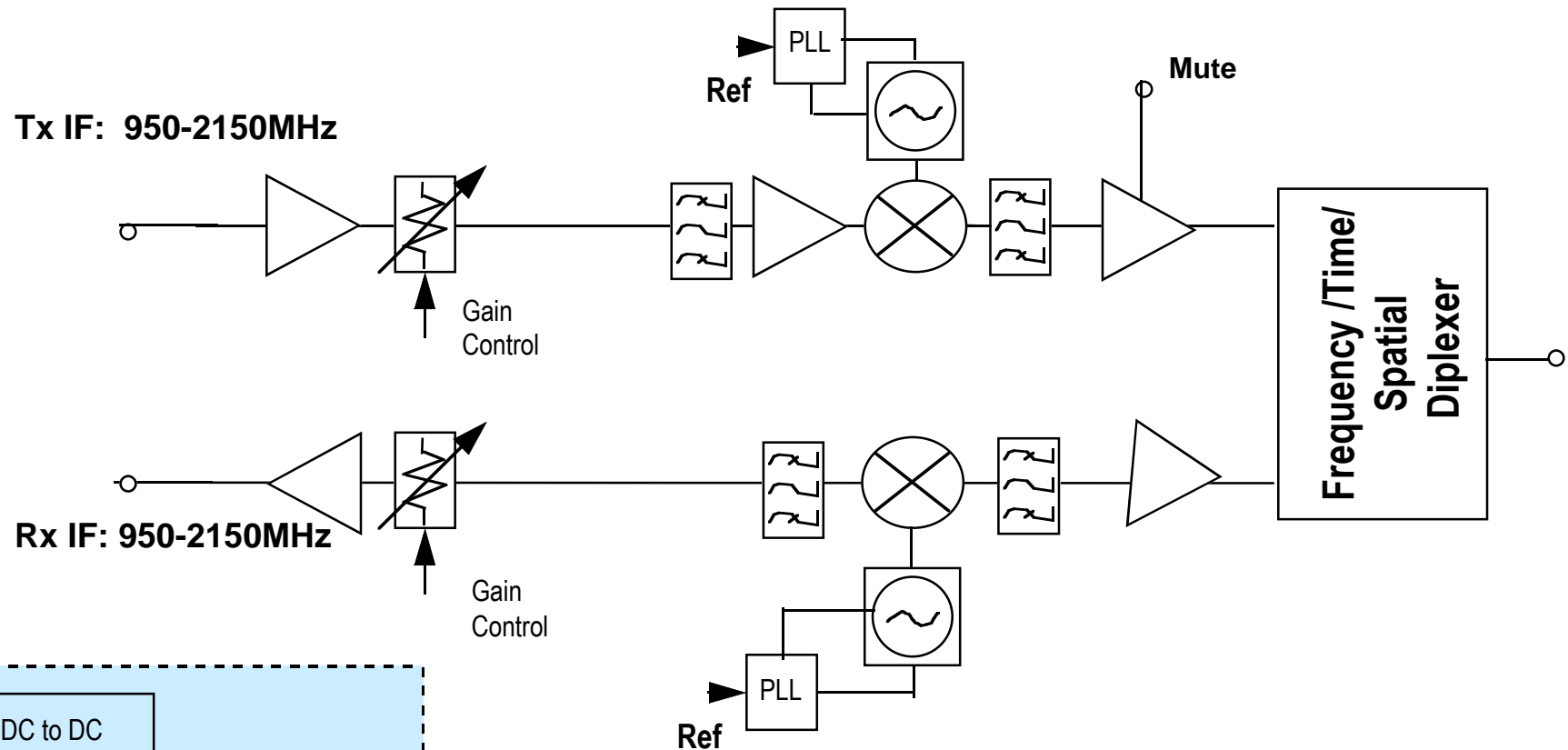
Millimeter Wave Products

Generic LMDS RF ODU- L Band IF's



Millimeter Wave Products

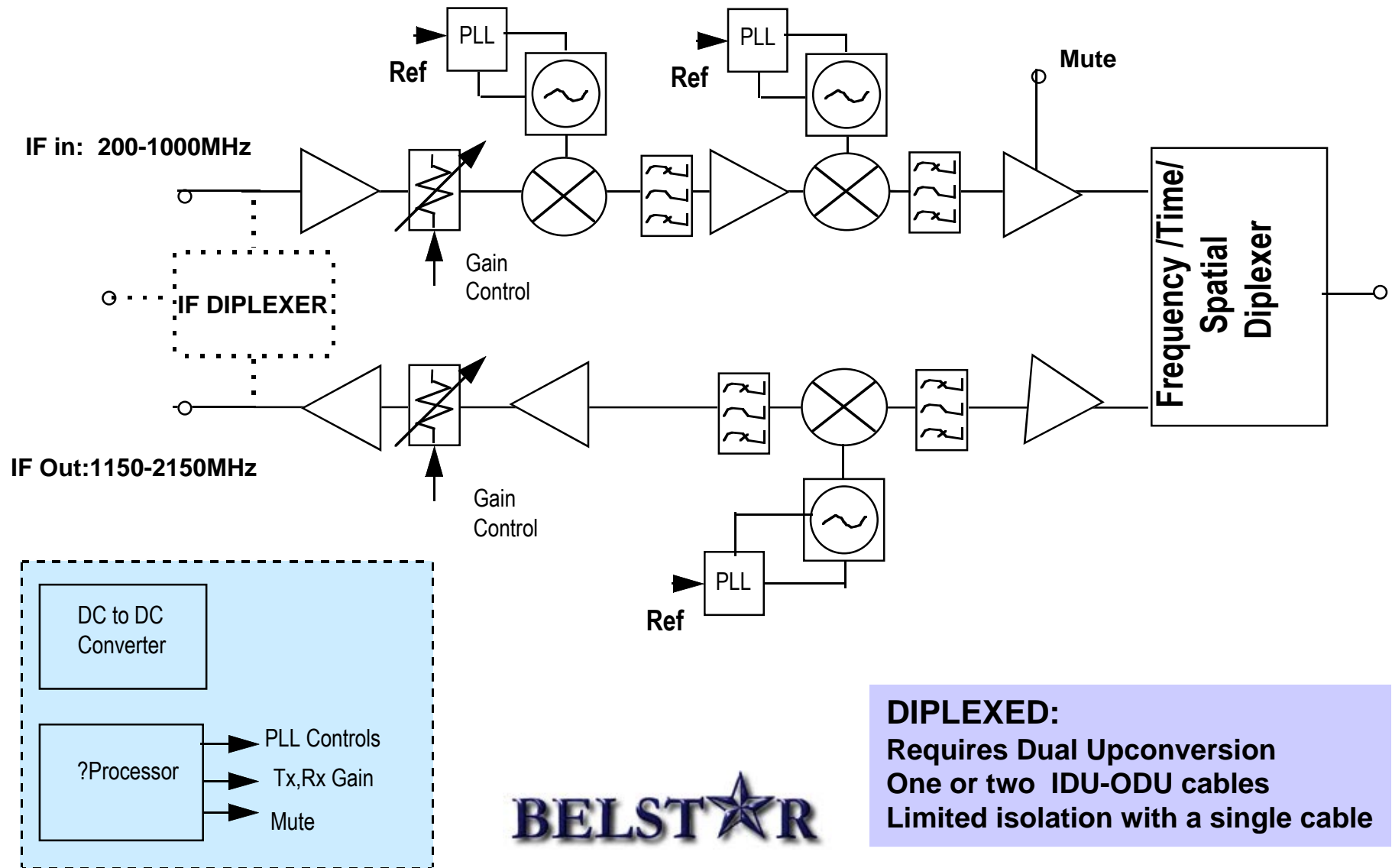
Generic LMDS RF ODU- Dual L Band IF's



BELSTAR

Separate Independent Tx & Rx Chains
Two IDU-ODU cables
Required Guard Band: None
Maximum Isolation

Generic LMDS RF ODU - DIPLEXED



DIPLEXED:
 Requires Dual Upconversion
 One or two IDU-ODU cables
 Limited isolation with a single cable